

Assessing the Biological Integrity of Wetlands in Montana using Bird Communities

SPONSORING ORGANIZATION

Division of Biological Sciences
University of Montana
Missoula, MT 59812

CONTACTS

Richard Hutto
Professor of Biology
Division of Biological Sciences
University of Montana
Missoula, MT 59812
hutto@selway.umt.edu
(406) 243-4292 phone
(406) 243-4184 fax

and

Jock Young
Division of Biological Sciences
University of Montana
Missoula, MT 59812
bioljsy@selway.umt.edu
(406) 243-6499 phone
(406) 243-4184 fax

State contact: Lynda Saul, MDEQ Wetland Coordinator

November 27, 2002

Appendix B -REVIEW TEAM PROPOSAL CHECKLIST

Please CHECK the boxes for each component that your proposal meets and RETURN with your proposal

The purpose of the following checklist is to assist EPA in assuring all proposals are reviewed by the appropriate program experts and / or teams and is not intended to reflect priorities for funding. All proposals will be screened for eligibility under each of the grant programs described in the RFP and all eligible grant applications will be considered for funding. An EPA review panel will make the final determination regarding under which grant programs the project or separable components of a project may be considered.

- X *I am willing to accept funding at a lower level than my request, or partial funding covering some project components, OR*
D *I am not willing to accept funding at a lower level than my request*

Geographic & Special Emphasis Areas:

- D 1-70 Corridor (Golden to Glenwood Springs)
X Upper Missouri River Basin
D Yellowstone River Corridor, Montana
D Missouri Wild and Scenic/Recreational Rivers, Montana/South Dakota
D Big Sioux River Basin, South Dakota
D Missouri River Mainstem Garrison reach, North Dakota
D Missouri River Mainstem Fort Peck reach, Montana/North Dakota
D Red River/Devils Lake Basin, North Dakota/Minnesota
D Cherry Creek Watershed, Colorado
D State/Tribal Unified Watershed Assessment high-priority watershed
D Watershed Affected by CBM Development (Montana, Wyoming, Utah, Colorado)
X Assessment or monitoring
X Volunteer Monitoring

Water Program:

- D Pretreatment
D Biosolids
D Wet Weather (e.g. storm water, sanitary sewer overflows)
D Concentrated Animal Feeding Operations
D Wastewater
D Coal Bed Methane
D Mining
D Reduction, Prevention, or Elimination of Pollutants in Surface Water

Wetland Program areas:

- X Project directly related to wetlands protection or assessment.

TMDL Development:

- D End product is an assessment or monitoring information related to a 303(d) listed waterbody for the development of a TMDL
D End product is an assessment of a 303(d) listed waterbody
D End product is a TMDL for a 303(d) listed waterbody
D End product is implementation of a TMDL

Regional Geographic Initiative

- X Addresses Geographic and / or Special Emphasis areas listed above
D Addresses environmental issues on a landscape scale using a multi-media or multi-program approach
X Leverages resources from and builds relationships in a variety of programs and agencies aimed towards environmental results
D Creates a strategy/plan for focusing resources and community approaches to environmental problem-solving

EXECUTIVE SUMMARY

PROJECT TITLE

Assessing the Biological Integrity of Wetlands in Montana using Bird Communities

HYDROLOGICAL UNIT CODES INVOLVED:

Watershed Name: Red Rock, Montana; USGS Cataloging Unit: 10020001

Watershed Name: Middle Milk, Montana; USGS Cataloging Unit: 10050004

ENVIRONMENTAL SETTING /PROBLEMS

To effectively develop a comprehensive wetland monitoring and assessment program, the Montana Department of Environmental Quality (DEQ) has been working with the Montana Natural Heritage Program, the University of Montana, and other partners to collaboratively develop landscape-level assessments, biological criteria for important wetland functional groups, and rapid assessment protocols. There is a need to develop biological criteria based on bird communities that will help us to better assess the cumulative effects of multiple stressors. The development of such an Index of Biotic Integrity (IBI) will be greatly aided by the work of partners collecting data at the same sites for human stressors, water quality, macroinvertebrates, and vegetation.

MAJOR GOALS

The main goal of this project will be to develop biological criteria for wetland monitoring and assessment using bird communities. This will involve 1) testing survey methods for wetland birds, 2) modeling bird-habitat relationships, 3) determining the metrics that best reflect the gradient of human disturbance, and 4) testing rapid assessment protocols using volunteers.

PROJECT SUMMARY

We will survey wetland bird populations at preselected riverine and depressional wetlands in the Middle Milk watershed, and riverine and slope wetlands in the Red Rock watershed. These sites have been selected by the Montana Interagency Wetland Monitoring and Assessment Work Group to represent a human disturbance gradient, and they will be collecting data on vegetation, water quality, and other environmental variables. We will analyze these data in relation to our bird survey data and will develop metrics for wetland bird communities that are sensitive to human disturbance.

EPA Funds Requested: \$99,813 (two years)

Non-federal Match: \$33,271 (two years)

Total Project Costs: \$133,084 (two years)

ENVIRONMENTAL PROBLEM DESCRIPTION

A comprehensive wetland monitoring and assessment program is needed in Montana to determine the causes and extent of human effects on wetland resources and to develop appropriate conservation, management, and restoration strategies. To effectively develop a comprehensive program, the Montana Department of Environmental Quality (DEQ) has been working with the University of Montana, the Montana Natural Heritage Program, and other partners to collaboratively develop landscape-level assessments, biological criteria for important wetland functional groups, and rapid assessment protocols.

The development of biological criteria based on faunal communities has become an important approach to wetland monitoring and assessment (Adamus et al. 2001). The concept of the Index of Biotic Integrity (IBI) was developed by Karr (1991) using fish species assemblages, based on the ecological principle that biological communities will best reflect the cumulative effects of multiple stressors. The concept has since been extended to other faunal groups such as birds (U.S. EPA 2002).

Birds have often been proposed as indicators of ecosystem health (Morrison 1986, Croonquist and Brooks 1991). The bird community in a wetland will reflect an integration of a broad array of ecosystem conditions, including water quality, productivity, vegetation structure and composition, and landscape integrity (Adamus et al. 2001). The cumulative effects of alterations in these ecosystem conditions are difficult to predict in any other way (Harris 1988). Furthermore, a large number of bird species can be surveyed using one or more cost-effective techniques. Therefore, it is possible to look at entire communities representing a broad array of ecological niches (Hutto 1998), thus improving the integration of information from the entire ecosystem.

Riparian and wetland areas typically support more species of breeding and migratory birds than any other habitats in the West (Ohmart 1994), even though they account for less than 1% of the landscape (Knopf et al. 1988). A large proportion of declining bird species and species of concern are dependent on riparian and wetland habitats. These species and habitats are a critical part of conservation plans being developed by national initiatives such as Partners In Flight and the North American Waterbird Conservation Plan. Information obtained in this proposed project will be integrated directly into those plans due to our close ties with these initiatives.

The development of effective biocriteria based on bird community composition requires the collection of a large amount of independent data on other measures of human disturbance. This requirement is usually beyond the scope of most bird monitoring efforts. The proposed project will be greatly aided by the collaboration with partners in the Montana Interagency Wetland Monitoring and Assessment Work Group, who will be collecting independent data at the same sites on water quality, diatoms, macroinvertebrates, vegetation, and human stressors. The bird data and resulting indices will thus become part of a comprehensive wetland monitoring and assessment program in Montana.

GOALS OF THE PROJECT

The main goal of this project will be to develop biological criteria for wetland monitoring and assessment using bird communities. This will involve several steps that may provide important ecological or management information in themselves:

- 1) We will test survey methods that will efficiently quantify the bird community at various types of wetlands. These methods will be used in a separate state-wide monitoring program for wetland birds as well as for the development of wetland assessments.
- 2) We will model bird-habitat relationships using our bird data and the habitat data collected by partners, to identify the habitat specialists that may be most useful in biological assessment, and to determine the categories of wetlands that the bird communities seem to perceive as different.
- 3) We will analyze the bird data in relation to the other data collected by partners (vegetation, water quality, human stressors, etc.), to determine the metrics and indices (IBI) that best reflect the gradient of human disturbance.
- 4) We will test rapid assessment protocols using volunteers. Successful volunteer protocols will also be very useful in the development of a cost-effective statewide monitoring program for wetland and upland birds.

DESCRIPTION OF PROJECT

To achieve the above goals, we will evaluate riverine and depressional wetlands in the Middle Milk watershed (4th level hydrologic unit code [HUC] 10050004) in the Great Plains ecoregion, and riverine and slope wetlands (Brinson 1993) in the Red Rock watershed (HUC 10020001) in the Valley and Foothill Prairies ecoregion. We will then develop an Index of Biotic Integrity (IBI) based on the correlation of these bird survey data with other data being collected at the same sites.

Objective 1: Select sites representing a broad range of human disturbance

A useful IBI requires the selection of survey sites along a gradient of human disturbance conditions, including undisturbed reference sites. Fortunately, these sites have already been selected by the other partners on the Montana DEQ project, comprising the Montana Interagency Wetland Monitoring and Assessment Work Group. The design of this collaborative effort involves 30 sites in each wetland type of interest, and in each HUC. Specifically, 30 riverine and 30 depressional wetlands in the Middle Milk watershed, and 30 riverine and 30 slope wetlands in the Red Rock watershed. We will coordinate with this Work Group to ensure that the selection of wetlands will be appropriate for our planned bird assessments, and that we have permission to access all sites by the time field work begins.

Cost Estimate: \$0 EPA. As this task will need to be done before the spring of 2003, it will be supported by funds from other sources.

Objective 2: Conduct bird surveys in first field season (2003)

The project coordinator will hire, train, and supervise two seasonal field technicians. Training will be made more efficient by joining with the annual training session for our ongoing USFS landbird monitoring program. All three employees will survey selected sites in both the Red Rocks and Middle Milk watersheds during the first field season. This first season will require some testing of survey methods for bird species that use wetlands, especially wetland habitat specialists. We have contacts with the national initiatives developing standards for

survey methods of wetland bird species (e.g. the North American Waterbird Conservation Plan), and we have extensive experience conducting point count surveys for riparian songbirds. Many species will be surveyed by point counts (Ralph et al. 1995), but some species will require special survey techniques, such as area searches (Slater 1994) or call-response surveys (Gibbs and Melvin 1993). We will also conduct more intensive (Level 3) surveys of a subset of the sites in order to validate and calibrate the point counts and other (Level 2) rapid assessment methods (Bart and Earnst 2002).

Cost Estimate: \$43,082 (\$32,312 EPA, \$10,770 non-federal match)

Output: Surveys will be conducted on at least 20 sites in each HUC. Data will be entered into electronic databases. A summary report will specify field season tasks accomplished.

Objective 3: Preliminary analyses of data will inform our strategy for the second field season.

After the first field season is finished, the program coordinator will check the quality of the data and begin to analyze it. Preliminary analyses during the first year will emphasize information that can be used adapt the plan for the second field season. These will include examining variability in the data to ensure that the planned sample size will have sufficient power to achieve project goals, determining the most effective and efficient of the survey methods used, and determining whether additional variables or a broader array of human disturbance conditions will be needed in the second field season. We will then model the habitat relationships of bird species to identify habitat specialists and sensitive species that may be most useful in biological assessment, and begin work on developing potential metrics for an IBI.

Cost Estimate: \$17,526 (\$13,145 EPA, \$4,381 non-federal match)

Output: We will produce a progress report on the results of preliminary analyses and our specific plans for the second field season.

Objective 4: Survey all established sites in second field season (2004)

In the second field season we will conduct bird surveys at all sites that have been selected by the state working group (approximately 60 sites in each of the middle Milk and Red Rocks watersheds). We will be using survey methods that were validated in the previous year and were found to be appropriate for each wetland type. We will also collect any additional data or make necessary design changes that became apparent during evaluation of the first field season.

Cost Estimate: \$44,139 (\$33,104 EPA, \$11,035 non-federal match)

Output: Surveys will be conducted on all 60 sites in each HUC. Data will be entered into electronic databases. A summary report will specify field season tasks accomplished.

Objective 5: Test volunteer rapid assessment methods.

In the second field season, we will also coordinate additional surveys by volunteers at the same sites (probably only in the Red Rocks watershed) to test the feasibility of using volunteer birders for a rapid assessment procedure at wetlands. If successful, these could be an alternative to the Level 3 rapid assessment methods usually conducted by paid field workers. Bird surveys are one of the most promising tools for volunteer monitoring programs because of the widespread expertise and enthusiasm in the birding public. Montana Audubon will coordinate the field effort for this task, and the University of Montana will analyze the resulting data. Funds requested are for travel reimbursement of volunteers and minimal coordination costs.

Cost Estimate: \$4,200 (\$3,150 EPA, \$1,050 non-federal match)

Output: Volunteers will survey as many sites as possible in the Red Rocks watershed. These data will be compared to the more intensive survey work conducted at the same sites, and results and conclusions will be included in the final report.

Objective 6: Develop metrics for assessment of biological integrity

Following the second field season we will analyze the bird data in conjunction with the data collected by other partners working with DEQ at the same sites (e.g. vegetation, microfauna, and human stressors). Correlations among these data sets will help us identify bird community metrics (e.g. number of sensitive species or other combinations) that are most sensitive to the human disturbance gradient. These will then be combined into a multimetric Index of Biotic Integrity that can be used in wetland assessments in similar habitats throughout Montana. Indices in the Red Rocks and middle Milk watersheds are likely to be different.

Cost Estimate: \$18,457 (\$13,842 EPA, \$4,615 non-federal match)

Output: The final report will explain the Index of Biotic Integrity and the development of its components, as well as the recommended methods to collect the necessary data.

Objective 7: Integrate our data with other monitoring databases

Our survey data will be converted to the formats necessary to integrate with several existing databases, including the EPA's STORET repository (<http://www.epa.gov/storet/>), the Patuxent national point count database, the database for our statewide all-bird monitoring plan being developed in collaboration with Partners in Flight, and the Cornell Lab of Ornithology, where we have already collaborated in a web-based, interactive database for our current landbird monitoring program (<http://www.birdsource.org/LBMP/>).

Cost Estimate: \$2,840 (\$2,130 EPA, \$ 710 non-federal match)

Output: Accomplishments from this objective will be included in the final report.

Objective 8: Coordinate with the Montana Interagency Wetland Monitoring and Assessment Work Group

Throughout this project we will coordinate with other members of the Montana Interagency Wetland Monitoring and Assessment Work Group in order to collaboratively develop a comprehensive program to assess and monitor the health of streams and wetlands. This group will ensure that methods are standardized across all projects. Through group meetings, partners will be able to share what they learned and revise their study designs accordingly. The group will also help to synthesize functional group metrics into a rapid bioassessment protocol. This group has already developed a single QAPP (Quality Assurance Project Plan) for the entire wetland assessment and monitoring program, and we will be providing a chapter in that plan for our part of the larger project.

Cost Estimate: \$2,840 (\$2,130 EPA, \$ 710 non-federal match)

LITERATURE CITED:

Adamus, P. R, T. J. Danielson, and A. Gonyaw. 2001. Indicators for monitoring biological integrity of inland, freshwater wetlands: A survey of North American technical literature (1990-2000). U.S. Environmental Protection Agency, Office of Water, Wetlands Division. Washington, D.C. EPA 843-R-01.

- Bart, J. and S. L. Earnst. 2002. Double sampling to estimate bird density and population trends. *Auk*: 119:36-45.
- Brinson, M. M., 1993, Hydrogeomorphic classification for wetlands: Washington, D.C., U.S. Army Corps of Engineers, Wetlands Research Program Technical Report WRP-DE-4, 79 p.
- Croonquist, M., and R. Brooks. 1991. Use of avian and mammalian guilds as indicators of cumulative impacts in riparian wetland areas. *Environmental Management* 15(5):701-714.
- Gibbs, J. P., and S. M. Melvin. 1993. Call-response surveys for monitoring breeding waterbirds. *Journal of Wildlife Management* 57:27-34.
- Harris, L. D. 1988. The nature of cumulative impacts on biotic diversity of wetland vertebrates. *Environmental Management* 12: 675-693.
- Hutto, R. L. 1998. Using landbirds as an indicator species group. Pp. 75-92 in Marzluff, J. M., and R. Sallabanks (eds.), *Avian conservation: Research and Management*. Island Press, Covelo.
- Karr, J. R. 1991. Biological integrity: a long-neglected aspect of water resource management. *Ecological Applications* 1: 66-84.
- Karr, J. R. and E. W. Chu. 1997. Biological monitoring and assessment: Using multimetric indexes effectively. EPA 235-R97-001. University of Washington, Seattle, WA.
- Knopf, F.L., R.R. Johnson, T. Rich, F.B. Samson, and R.C. Szaro. 1988. Conservation of riparian ecosystems in the United States. *Wilson Bull.* 100:272-284.
- Morrison, M. 1986. Bird populations as indicators of environmental change. *Curr. Ornithology* 3:429-451.
- Ohmart, R. D. 1994. The effects of human-induced changes on the avifauna of western riparian habitats. Pp. 273-85 in Jehl J. R., and N. K Johnson (eds.). *A century of avifaunal change in western North America*. Cooper Ornithological Society, Studies in Avian Biology No. 15.
- Ralph, C. J., S. Droege, and J. R. Sauer. 1995. Managing and monitoring birds using point counts: standards and applications. Pp. 161-168 in Ralph, C.J., et al. (eds.). *Monitoring bird populations by point counts*. USDA For. Serv. Gen. Tech. Rep. PSW-GTR-149.
- Slater, P. J. 1994. Factors affecting the efficiency of the area search method of censusing birds in open forests and woodlands. *Emu* 94: 9-16.
- U.S. EPA. 2002. Methods for evaluating wetland condition: biological assessment methods for birds. Office of Water, U.S. Environmental Protection Agency, Washington. D.C. EPA-822-R-02-023.

OUTPUTS AND PROGRESS REPORTS

Biannual progress reports will be submitted to Montana DEQ over the two-year period of the project. Progress reports will include a summary of accomplishments during the reporting period, status and expenditure of funds, and planned activities over the next reporting period.

October 1, 2003: Surveys will be conducted on at least 20 sites in each HUC. Data will be entered into electronic databases. A summary report will specify field season tasks accomplished.

February 1, 2004: We will produce a progress report on the results of preliminary analyses and our specific plans for the second field season.

October 1, 2004: Surveys will be conducted on all 60 sites in each HUC. Data will be entered into electronic databases. A summary report will specify field season tasks accomplished.

May 1, 2005: A final report will be submitted detailing the Index of Biotic Integrity and the development of its metrics, other information on bird-habitat relationships, and the validation of the rapid assessment protocols. One copy of the final report will be submitted to Montana DEQ, and two copies will be submitted to the EPA.

MILESTONES

Project start date: July 1, 2003 / Project end date: June 30, 2005

Task	Pre-Project	Through Sep. 2003	Through Jan. 2004	Through Sep. 2004	Through Jan. 2005
Objective 1. Identify and select sites	X				
Objective 2. Test methods and survey		X			
Objective 3: Preliminary analyses			X		
Objective 4. Survey all sites				X	
Objective 5: Test volunteer assessment				X	X
Objective 6: Develop metrics and IBI					X
Objective 7: Integrate databases					X
Objective 8: Coordinate with DEQ	X	X	X	X	X

Budget by Objective	Total	EPA	Match
Obj. 1. Site selection and study prep.	\$ 0	\$ 0	\$ 0
Obj. 2. First field season	\$ 43,082	\$32,312	\$10,770
Obj. 3. Preliminary analyses	\$ 17,526	\$13,145	\$ 4,381
Obj. 4. Second field season	\$ 44,139	\$33,104	\$11,035
Obj. 5. Volunteer assessments	\$ 4,200	\$ 3,150	\$ 1,050
Obj. 6. Development of IBI	\$ 18,457	\$13,842	\$ 4,615
Obj. 7. Database integration	\$ 2,840	\$ 2,130	\$ 710
Obj. 8. Coordination with DEQ	\$ 2,840	\$ 2,130	\$ 710
Total	\$133,084	\$99,813	\$33,271

Budget for University of Montana wetland proposal; July 2003-June 2005

Assessing the Biological Integrity of Wetlands in Montana using Bird Communities

Personnel	EPA Funding Request				Non-Federal Matching Funds	
	salary		2003	2004	Total	Total
	rate	duration				
Hutto	\$320	5 days	\$1,600	\$1,680	\$3,280	\$0
Project Coordinator	\$32,000	6 months	\$16,000	\$16,800	\$32,800	\$0
Undergraduate	\$2,000	6 months	\$12,000	\$12,600	\$24,600	\$0
subtotal			\$29,600	\$31,080	\$60,680	\$0
	fringe					
	rate		total			
Hutto	0.225		\$360	\$378	\$738	\$0
Project Coordinator	0.3		\$4,800	\$5,040	\$9,840	\$0
Undergraduate	0.1		\$1,200	\$1,260	\$2,460	\$0
Project coordinator- health			\$2,346	\$2,496	\$4,842	\$0
(\$391/mo. in 2003; \$416/mo. in 2004)						
subtotal			\$8,706	\$9,174	\$17,880	\$0
Travel			\$6,000	\$7,000	\$13,000	\$0
Supplies			\$1,000	\$1,000	\$2,000	\$0
Publication costs				\$1,500	\$1,500	\$0
Total direct			\$45,306	\$49,754	\$95,060	\$0
Total indirect [5% MTDC]			\$2,265	\$2,488	\$4,753	\$0
Match--Waived Indirect used as match						
(40% MTDC less IDC as assessed)						\$33,271
Total Budget			\$47,571	\$52,242	\$99,813	\$33,271
Project Total						\$133,084
Percent Cost Sharing						25 %